High Power Compact Single-Frequency Volume Bragg Er-Doped Fiber Laser, Phase I

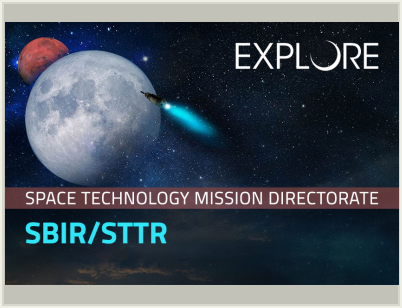
Completed Technology Project (2007 - 2007)

Project Introduction

The purpose of this NASA SBIR Phase I proposal is to develop the prototype of a compact single-frequency mode one longitudinal and one transverse mode laser oscillator (SFM) using a pulse pumped Er-doped multimode fiber as an active element inserted in the external cavity. The main feature of the proposed design is the use of volume transmitting or reflecting Bragg gratings for longitudinal and transverse mode selection in an external laser resonator. The technical approach for the development such a laser is based on application a new type of robust optical element as one of the cavity mirrors, a volume Bragg grating recorded in photo-thermo-refractive (PTR) glass. The selectivity of volume Bragg gratings to wavelengths, angles of incidence and at certain conditions to the state of incident polarization could be successfully applied in design of a novel type of a laser resonator. The use of volume Bragg gratings for mode selection instead of conventional fiber Bragg gratings will result in decreasing of power density by several orders of magnitude and, therefore, will increase threshold of laser damage and other nonlinear processes dramatically.

Anticipated Benefits

The main area of interest of DoD government agencies and private laser and semiconductor companies is focused on spectrally and angularly controlled diffractive beam deflectors, beam steering elements, mode selectors, incoherent and coherent beam combiners for both solid-state and semiconductor lasers, adjustable attenuators and beam splitters for laser beams. It is clear that the range of PTR technology applications is significantly wider that those mentioned above. OptiGrate is committed to develop these various applications and successfully bringing them to the commercial markets in a cost effective manner. Potential NASA commercial applications are in the fields of high-resolution spectroscopy, narrow-band filtering for detection of different chemical agents, spectral scanning with sub-Angstrom resolution, remote sensing and targeting, range finding, spectral sensing and other NASA based applications where diffractive optical components are the key elements. In general words, those narrow-band holographic elements will provide dramatic increase of signal-to-noise ratio for almost any types of transmitters and receivers which work in visible and near IR spectral regions. Moreover, such devises will enable a breakthrough in multiplexing/ demultiplexing processing for dense multichannel systems of optical communication and monitoring.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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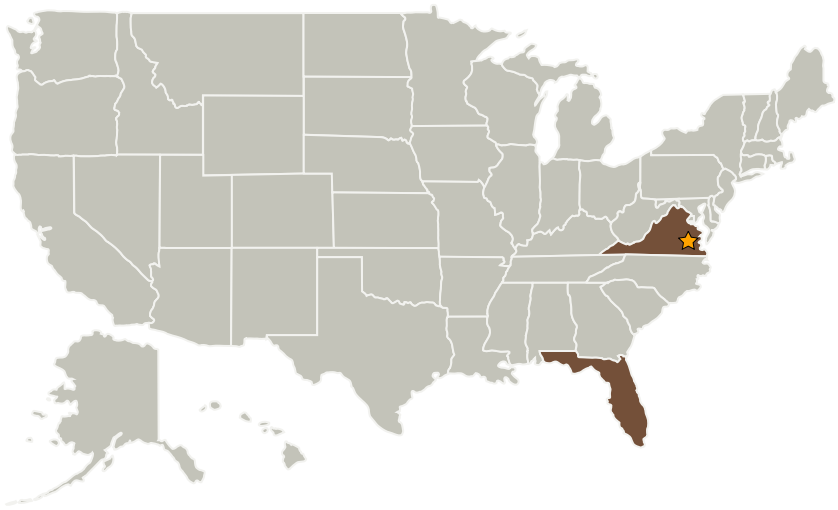
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
OptiGrate Corporation	Supporting Organization	Industry	Orlando, Florida

Primary U.S. Work Locations	
Florida	Virginia

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Project Manager:
Anthony L Cook

Principal Investigator:
Vadim Smirnov

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers